River Oaks HOA

c/o Paramont Property Management
5629 Strand Blvd, Suite 412
Naples, FL 34110

9/24/2018

Sediment Coring & Analysis

Prepared By

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Introduction

On September 24, 2018, the northern pond at the River Oaks community in Naples, FL was sampled for organic and inorganic sedimentation. Sample locations were based upon bathymetric mapping conducted the same day and also upon a spatial analysis of the water body. The presence and quantity of the organic and inorganic portions of the samples are listed on the following pages. Organic sediments are the remnant biological decay of all dead organisms or waste products of living things within the watershed of the pond. Some of the material comes from organisms living in the water body (internal loading) and some comes from organisms living on land within the watershed (external loading). This includes runoff fertilizer, blades of turf grass, leaves from trees or bushes, animal waste, fish, aquatic plants, algae, etc. Rainwater washes all terrestrial organic material into the pond. The material settles to the bottom or floats within the water column and becomes food for aquatic plants including algae. Inorganic sediments (clay or sand) are often an indicator of shoreline erosion which in turn can be managed to retain this material at the edge of the pond. Additionally, a Secchi disk reading was taken to measure how deep light is penetrating and is an indicator of nutrients in the water column.

Coring Methodology

A coring device, constructed of an acrylic tube and extended with three foot sections of PVC pipe is inserted from a boat into preselected sites. The device is then closed at the top creating suction which allows bottom sediments to remain in the acrylic tube. Once lifted to the surface, a rubber stopper is inserted into the bottom end of the acrylic. The acrylic tube is then removed from the extension(s). A visual inspection is made to measure 1) floc (flocculent), 2) organic matter, 3) sand and 4) clay. Four sites were preselected for extraction of materials from the acrylic tube utilizing a custom made plunging apparatus. The bottom rubber stopper is removed and the plunging rod is inserted into the bottom of the acrylic tube. The top rubber stopper is removed and the plunging rod is gently moved up the tube displacing the top levels of water until the floc layer is even with the top of the acrylic tube. A hand ruler is then utilized to measure the floc. The core is then dropped back in the water. Six additional sites were also chosen for visual inspection only. No extractions were performed on these samples.

Prentiss Pointe Irrigation Effluent Pond

Pond #	Perimeter (ft.)	Acres	Mean Depth (ft)	Acre-Feet	Volume (Gallons)
North Pond	2,050	3.5	4.6	15.92	~5,190,000

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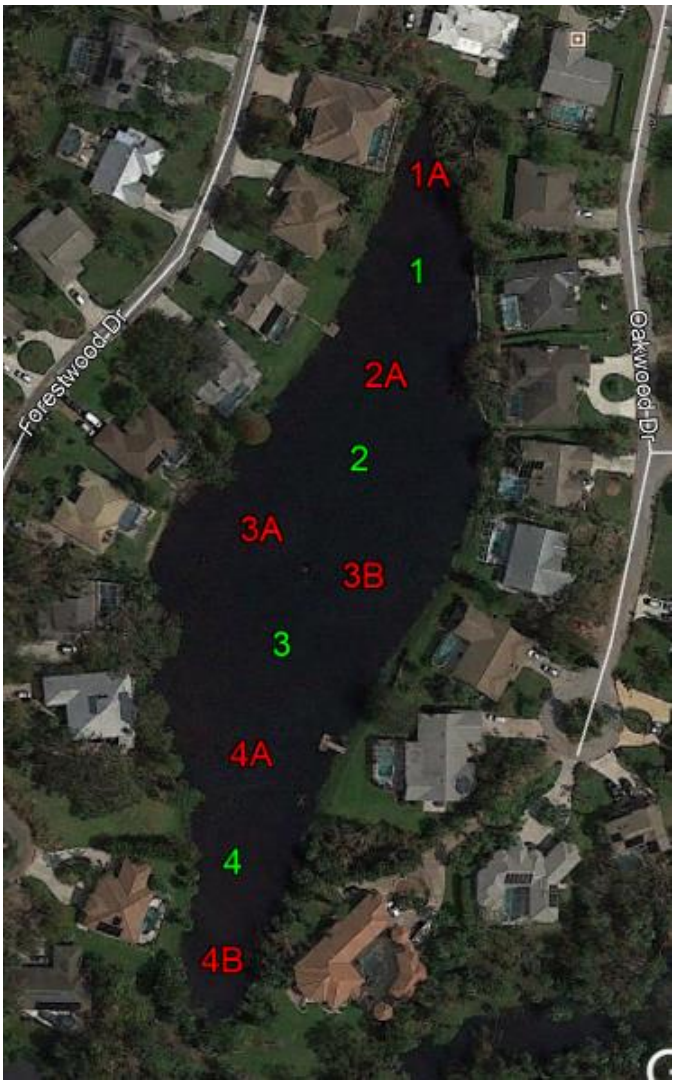
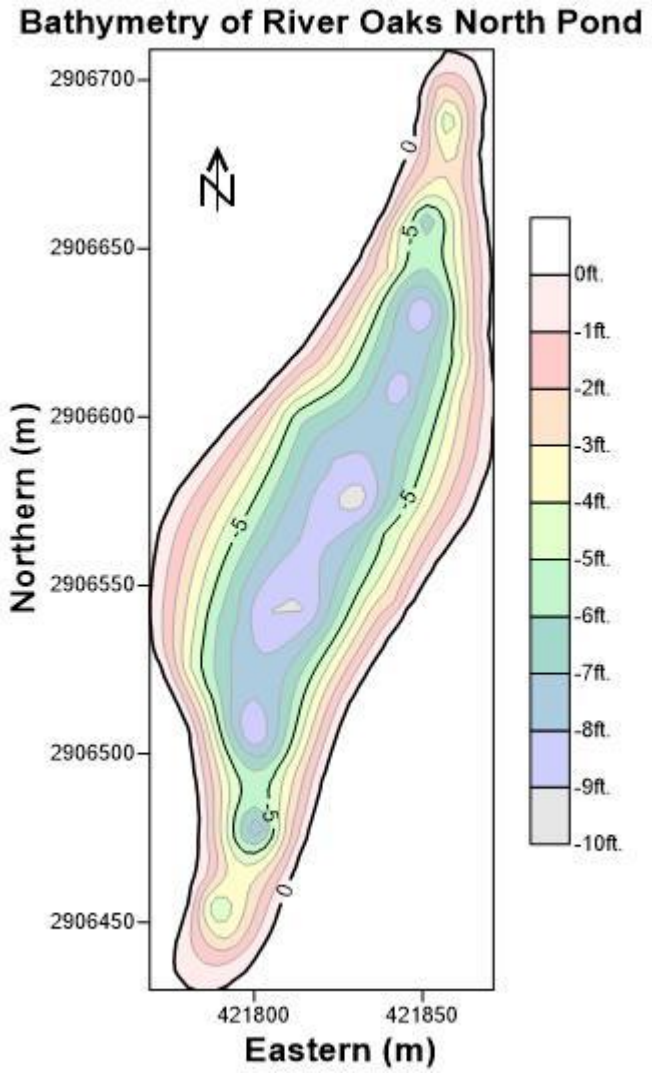
River Oaks – Northern Pond – Coring Sites and Data

Perimeter: 2,050 ft. Area: 3.5 acres Mean Depth: 4.6 ft. Volume: 15.92 Acre/ft or ~5,190,000 gallons





Name	Measured or Visual	Secchi (ft)	depth (ft)	Total length (in)	floc (in)	0rg (in)	Clay (in)	Sand (in)
RIOA-N-1	Measured	5.5	6	13.5	0.5	4	9	0
RIOA-N-1a	Visual		3	3	0.5	1.5	1	0
RIOA-N-2	Measured		9	18	0	10	8	0
RIOA-N-2a	Visual		8	7.5	0	7	0.5	0
RIOA-N-3	Measured		8	5	0	1	0	4
RIOA-N-3a	Visual		6	5	0.5	1.5	0	3
RIOA-N-3b	Visual		6	7	1	4	2	0
RIOA-N-4	Measured		8	19	0	10	9	0
RIOA-N-4a	Visual		8	6	0	3	1	2
RIOA-N-4b	Visual		6	4.5	0.5	2	2	0

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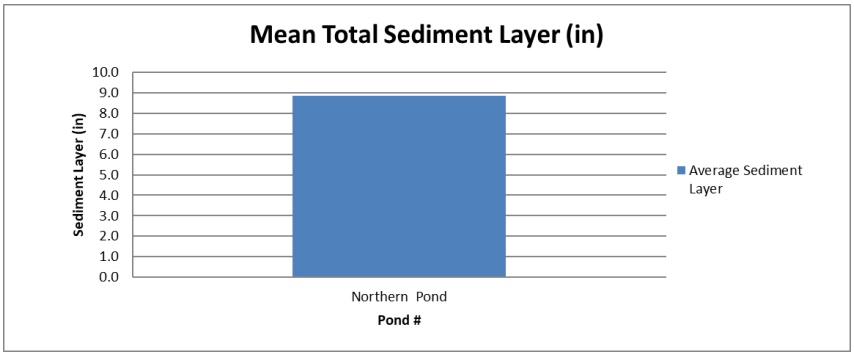
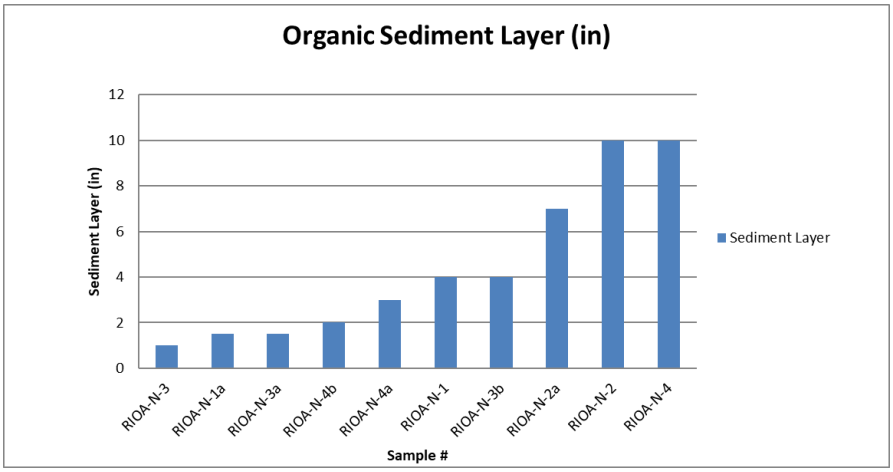
Analysis – Total Sediment Layer

One aspect of this study is the determination of how much total sediment is displacing water in the northern pond. The mean sediment depth in the samples was 8.9 inches (0.247 yards). This includes means of 4.4 inches of organic material, 4.2 inches of inorganic material and 0.3 inches of flocculent material. When multiplied by surface acreage of 3.5 acres (16,940 sq. yards), the sediments quantify as 4,184 cubic yards. This is a displacement of roughly 845,060 gallons of water. When compared to the present volume of 5,190,000 gallons, the displacement is roughly 14% of the basin. The pond's existence predates Google Earth aerials in early 1995 making the pond at least 23 years old in 2018. This means the pond at present rates of sediment accumulation would take over 200 years to completely fill in to the surface.



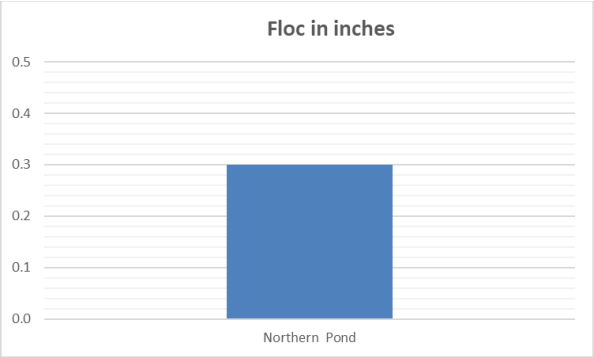
Analysis – Organic Material

In terms of the depth of organic material, the mean depth was 4.2 inches with distribution towards the center deeper channel of the pond with the exception of samples 3 and 4A with are located close to a working diffuser.



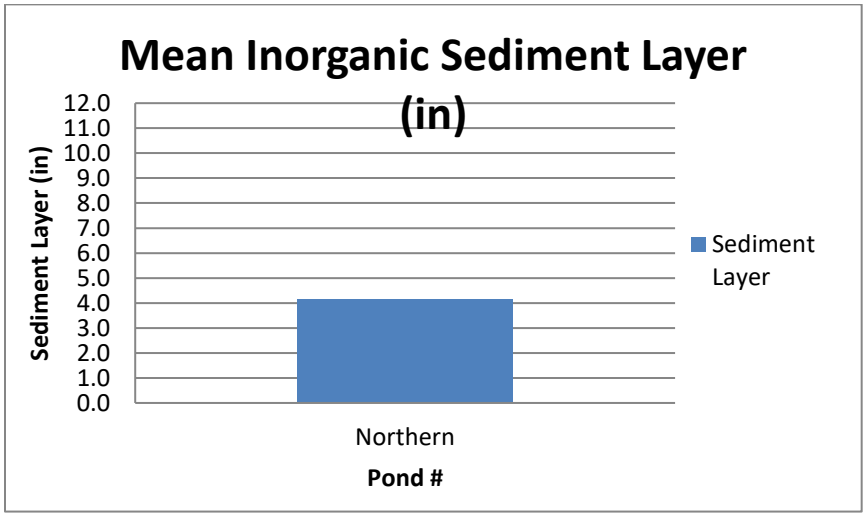
Floc

Floc is decayed material in the body of water that has sunk to the bottom and sits over the sediments. It has the consistency of water but is rich in organic material. In time, it will become part of the organic sediments or it may be reincorporated back into the water column through high wind events or temperature inversions. It is significant as an indicator of sedimentation in a pond. Floc results from each extracted station ranged from zero to one inch which are moderately low readings. Its presence can add to algae production in the pond. The floc layer will be highly disrupted in a properly aerated pond thus slowing sedimentation.



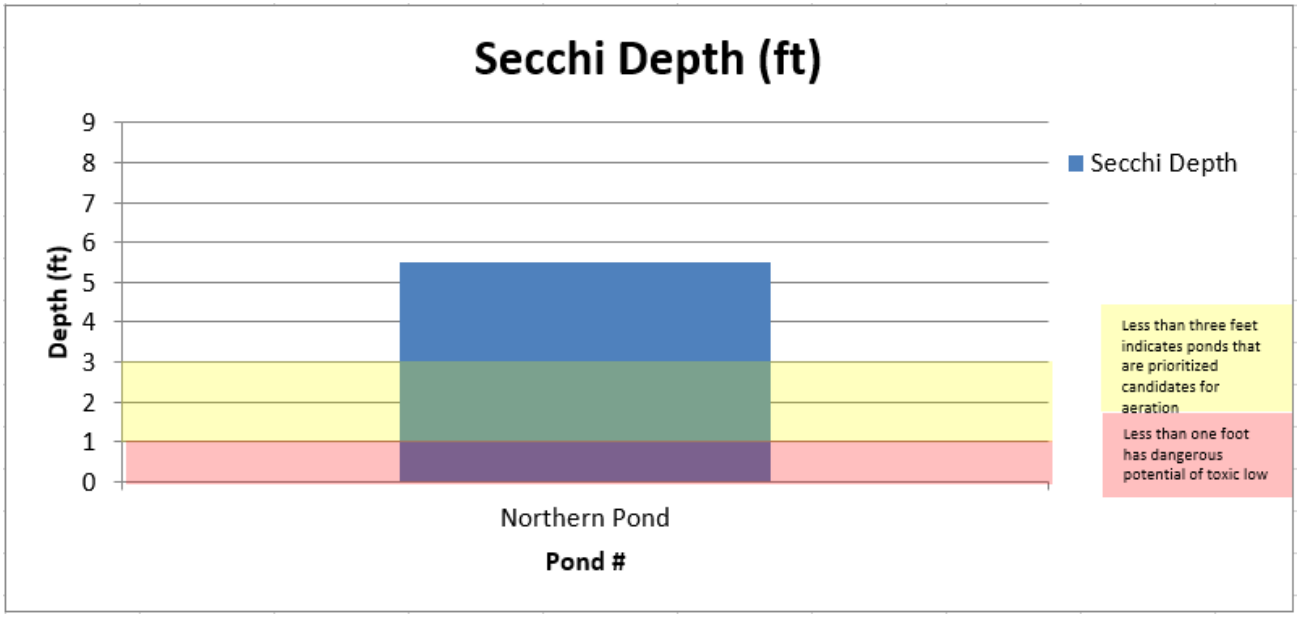
Inorganic Material

Inorganic sedimentation occurs from the initial excavation of the site and erosion processes along the shoreline. Samples ranged from 0.5 to 9 inches of inorganic sediments consisting entirely of sand measuring 0.5 to one inch which means there has been some apparent input from the shore line.



Secchi Disk Reading

A Secchi disk reading measures how deep an object can be seen from the surface and is an inexpensive means to see how far light can penetrate into the water column. Simply put, it measures how clear the water is. There are many factors that may contribute to clouding of the pond, many of which are caused by excess nutrients. The secchi disk reading at River Oaks – North Pond was 5.5 feet and therefore the reading which is a healthy number. Note, this is snapshot in time and can change monthly or even weekly depending on site conditions. Concerns mount as the reading falls to three feet or less indicating possible algal blooms in the water. Clouding of the water, especially green in nature, if it occurs will likely be in spring and summer months.



Summary

The northern pond at River Oaks has accumulated a moderate amount of organic sediment; however, it has done so in a relatively long period of more than 23 years from its inception. On the positive side, the many aquatic plants lining the banks have helped to sequester otherwise available plant nutrients that would have been food for algae. On the negative side, many of these plants are invasive or nuisance plants in SW Florida. Any management plans to control the nuisance plants should also include planting replacement native plants to prevent increases in the algae population. A diversity of native aquatic plants will compete better with the algae for the same food sources. The pond measured a mean depth of 4.4 inches of organic sediments distributed over its entire area with deeper pockets of up to 10 inches in deeper water. The overall water mean depth is 4.6 feet with the deepest areas measuring 10 feet in September which is at control elevation. At current rates of sedimentation, the pond would require over 200 additional years to fill in completely. Therefore, dredging of the pond is unneeded.

Ponds show their age through the sediments. Note, everything that dies in the water basin, which includes not just the pond, but the entire land based community, eventually washes into the pond where it decays and settles. Many other area ponds that are 25 years of age show much higher rates of sedimentation.

There are red flags though in the analysis. Stations throughout the pond possess relatively deep sedimentation. The organic portion of the sediments is pure plant food and is the source of the recently observed algae problem. The algae currently in the system is filamentous. It forms on the bottom and as it photosynthesizes, it rises to the surface.

Shoreline erosion does not appear to be a great contributor to overall sedimentation at this time although a more thorough aquatic planting of the shoreline with ongoing maintenance would be highly advised to diminish transfer of sediment to deeper water.

Recommendations

- Preventative springtime or early summer algae treatment
- Upgrading existing diffusers to new technology
- Consideration of an aggressive aeration design with 150 foot placement between diffusers.
- Pond management – phosphorus blockers
- Shoreline erosion corrections (not included in this report)

Diffuser Placement

The distance between the two diffusers is 530 feet. Diffusers are generally good for full mixing of the water up to 75 feet therefore 150 feet between diffusers is optimum for full pond mixing. Likewise, new technologies accomplish more aggressive mixing. Other than a check on diffuser spacing, analysis was not performed on the up to date aspect of the aeration system.

A proposed placement of diffusers with a maximum of 150 feet between one another and 75 feet from shore is illustrated below.

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Why aerate your ponds?

I. To stimulate indigenous and augmented bacteria

Indigenous bacteria are the bacteria that are present in a water body; augmented bacteria are the bacteria that are added to a water body. Both of these act as a filter for lakes and ponds. If there is too little oxygen, a water body becomes anaerobic and the bacteria present live without oxygen creating methane and other harmful toxins.

II. To minimize suspended solids in the water column and slow algae growth

Aerobic bacteria live and thrive with oxygen. They eat nutrients that algae consume for growth, so the more oxygen and aerobic bacteria you have, the fewer algae blooms occur.

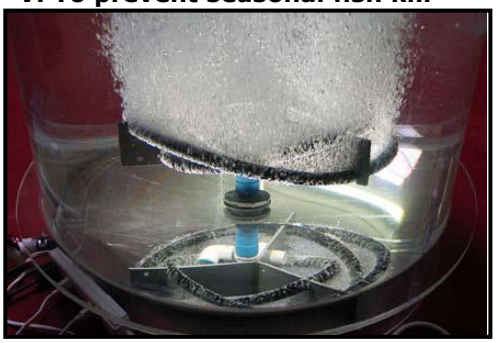
III. To increase decomposition of organics and the gases released from the sludge bed

Aerobic bacteria also eat organic matter and create carbon dioxide that is vented into the atmosphere instead of having the organic matter accumulate and stay bound up in your pond.

IV. To de-stratify a water body

Inversion is the complete turnover of a water body by nature. Two times per year, cooler surface water drops to the bottom of a water body bringing tiny bubbles with it which dissolve directly into the water adding oxygen. Aeration is a mechanical way to replicate inversion. Nature cannot invert many water bodies fast enough to breakdown the increase in toxins flowing into the water from its banks and those that come from the sub-soil. Aeration prevents "thermocline;" the condition in a water body where the water above a certain depth has oxygen in it and the water below contains no oxygen. By eliminating thermoclines, the whole body of water can become a healthy living system for aquatic life.

V. To prevent seasonal fish kill



Summer fish kills usually occur in the early morning, at which time the dissolved oxygen in a pond is at its lowest level. It is caused by oxygen depletion due to excess heat and decreased photosynthesis at night. Aeration maintains dissolved oxygen at healthy levels. Winter fish kills are caused by temperature inversions in which the water body can quickly flip. This steady decline in oxygen also minimizes respiration by bacteria. Aeration maintains dissolved oxygen at healthy levels.

VII. To oxygenate a water body and maintain its ecological balance

Aeration adds oxygen to a water body. This improves water quality by stimulating facultative and aerobic bacteria, minimizing excess nutrient and organic buildup, de-stratifying the water and supporting fish populations. Aeration sustains the ecological balance in a lake or pond.

** CES exclusively utilizes MixAir Technology Diffusers and equipment. MixAir Technology compared to other diffusers in the market offers much higher performance due to newer and more efficient design. Additionally, MixAir products require less maintenance. For more specific info on MixAir Technologies, please contact CES.*

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